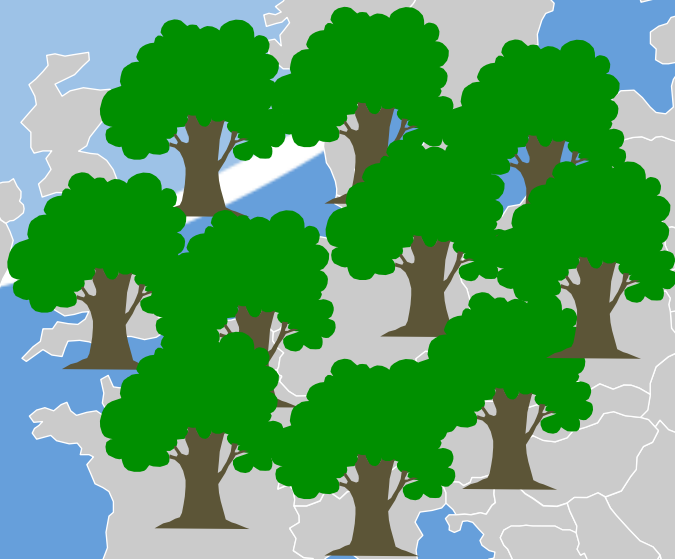




Europe's forests and forestry in a changing climate

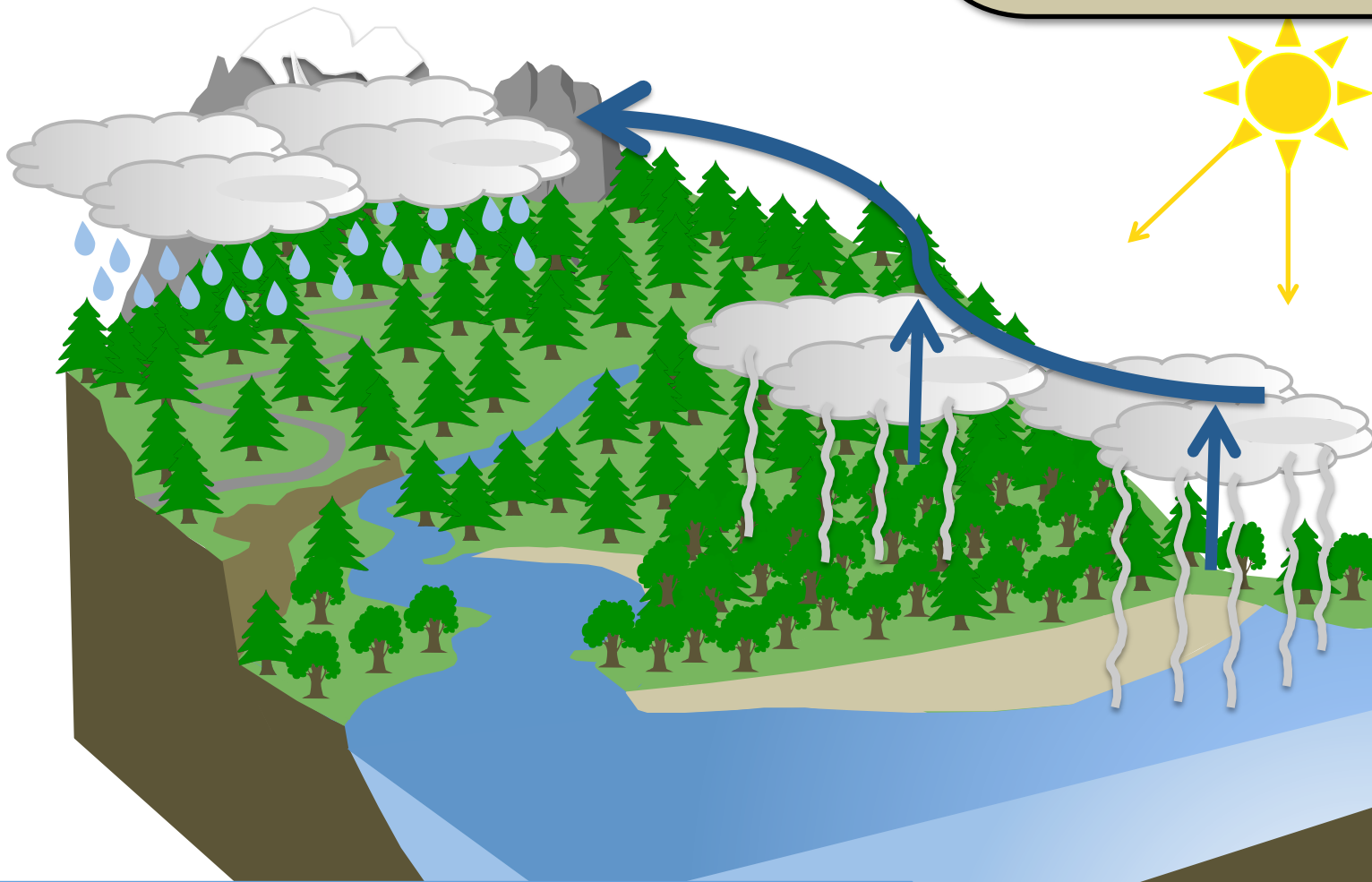
Part 4: Regulation of water flows





Forests cool locally and globally

Regulation of water flows

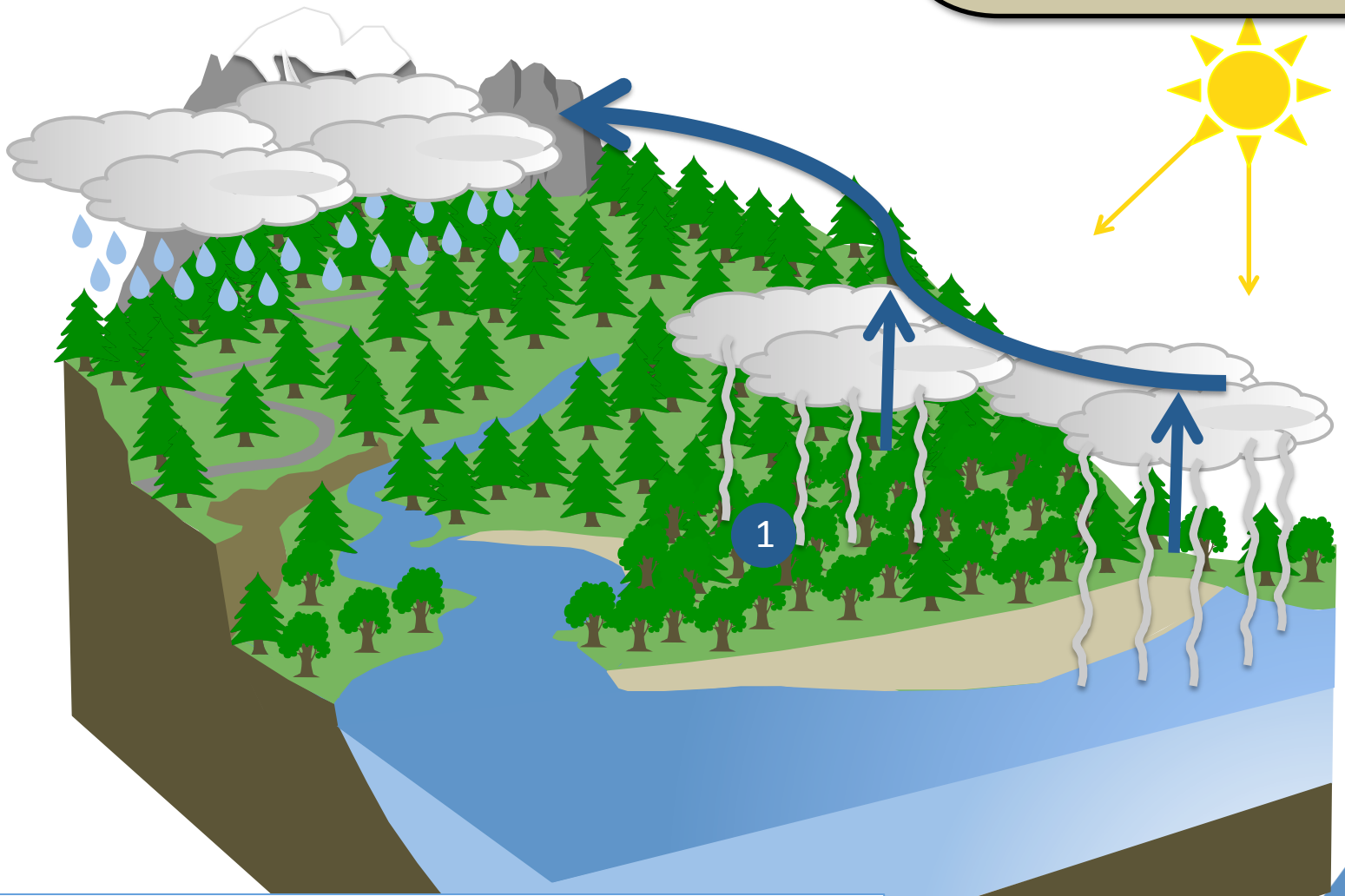


Forests provide multiple water and climate-related services, including precipitation recycling, cooling, water purification, infiltration and groundwater recharge. These services may be far more important, and are often underrated, when compared with traditional benefits such as food, fuel and fiber, and carbon storage. In addition, these services benefit and impact people well beyond the local or catchment scale, often far from where actual decisions on tree planting or removal are made.



Forests cool locally and globally

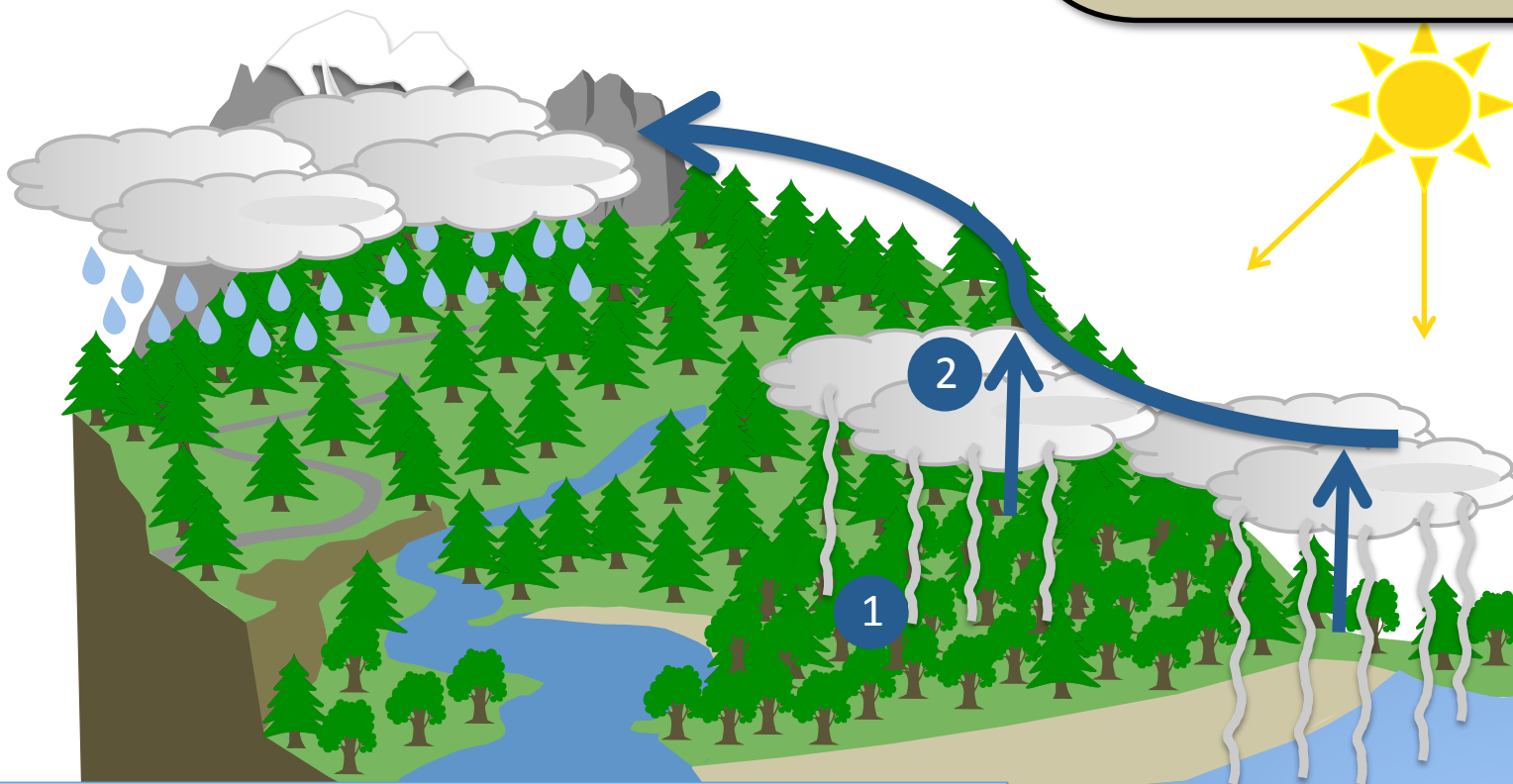
Regulation of water flows



1 Forests influence local and global temperatures and the flow of heat. Individual trees can transpire hundreds of litres of water per day. Every 100-litre of water transpired equals a cooling power equivalent to two average household central air-conditioning units per day. Additional regional and global cooling derives from the fact that forests can increase low-level cloud cover and raise reflectivity.

Forests are linked to rainfall and water availability

Regulation of water flows



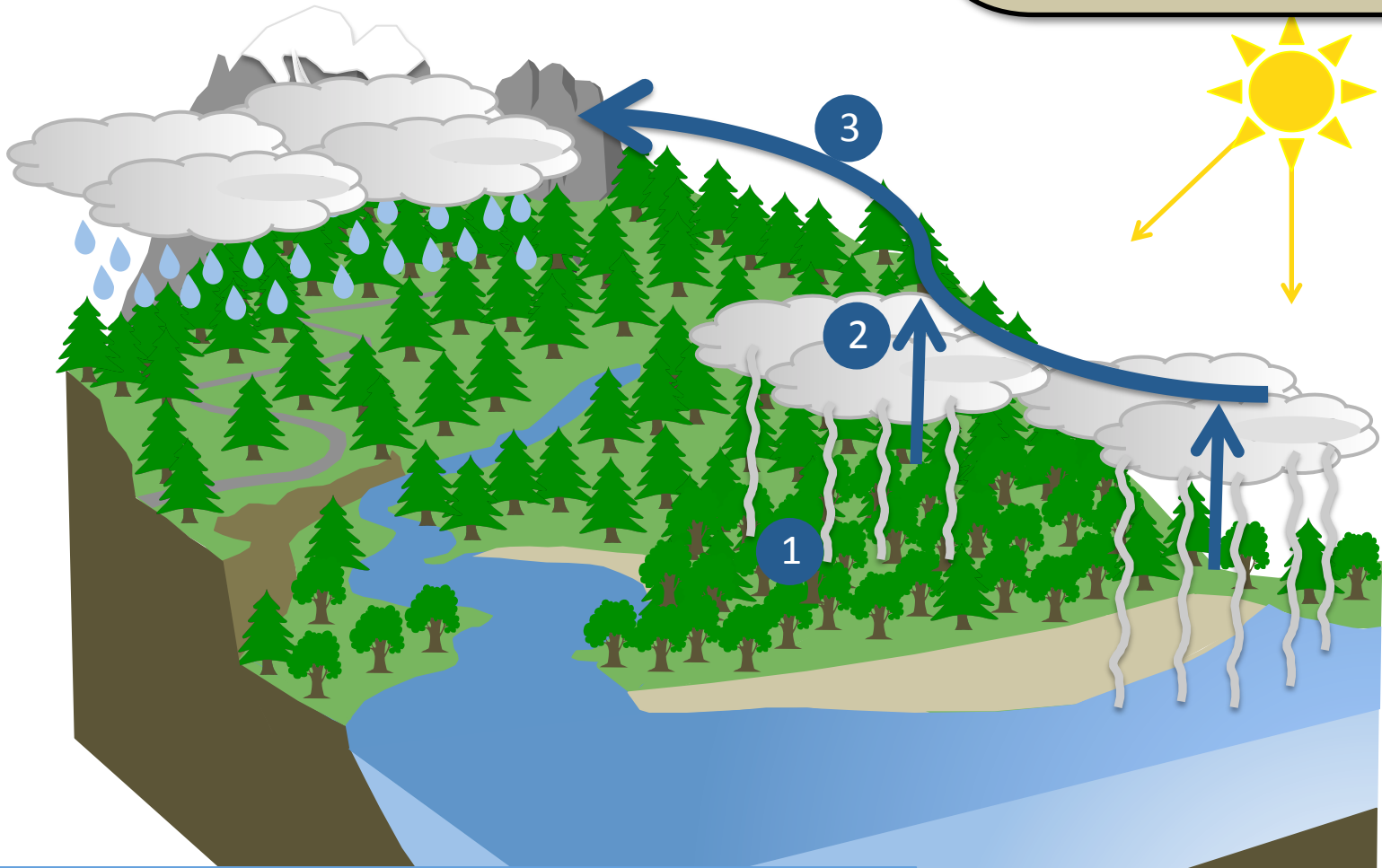
2

Forests contribute to atmospheric moisture and rainfall patterns over land through evapotranspiration: evaporation from soil and plant surfaces, and transpiration of water by plants. On average, at least 40% of rainfall over land originates from evapotranspiration. The resulting atmospheric moisture is circulated by winds across the Earth's continents and oceans. This is called "precipitation recycling".

Large-scale deforestation may reduce rainfall in some regions by as much as 30%. Altered rainfall patterns can lead to feedback effects on remaining vegetation, reduced biomass accumulation, drought, die-off and fires. Trees and forests also lead to more intense rainfall through the biological particles they release into the atmosphere.

Forests transport water locally and globally

Regulation of water flows



3

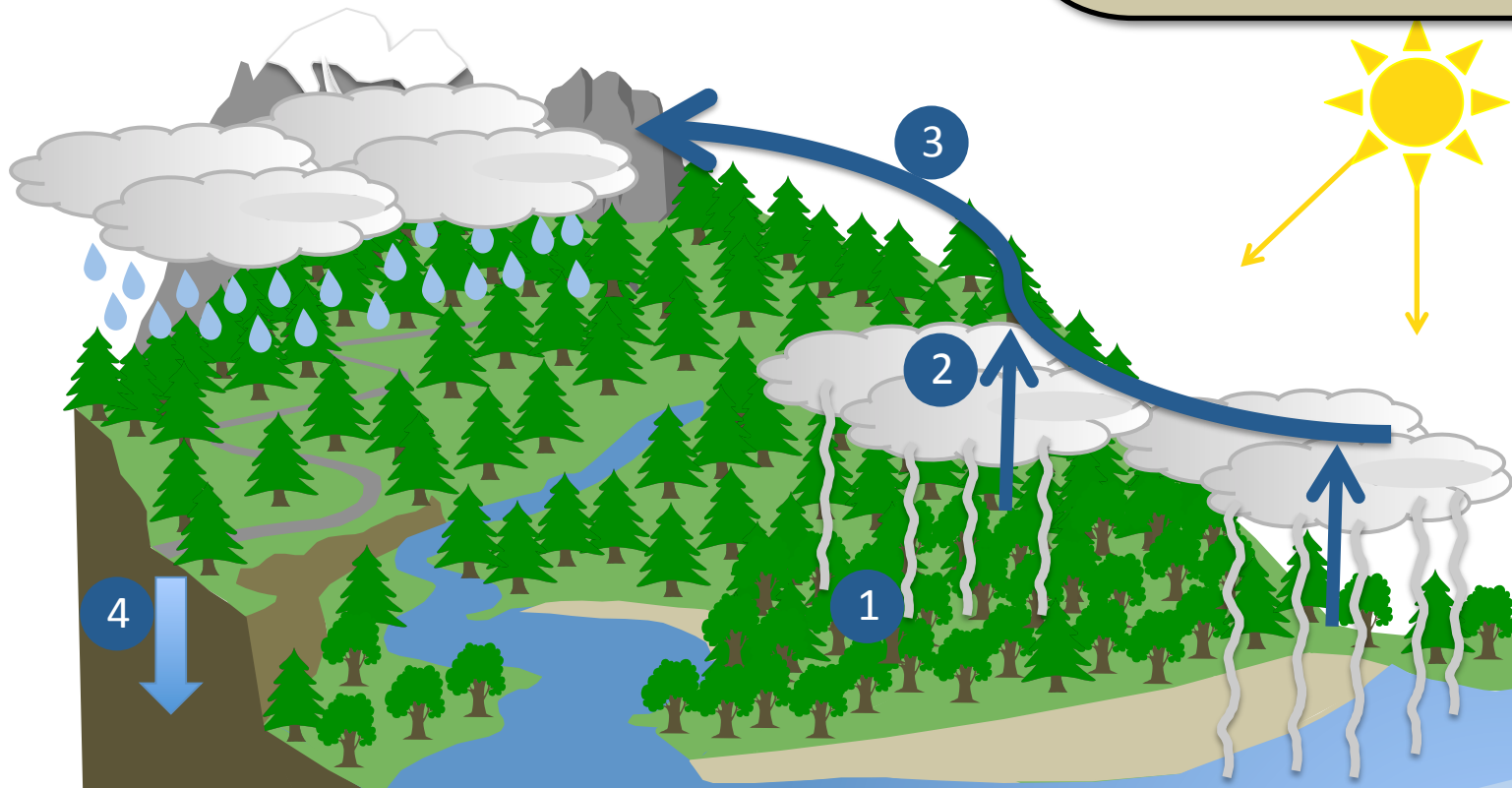
Large, continuous areas of forest drive the atmospheric circulation that brings rainfall to continental interiors. Through transpiration and condensation, forests actively create low pressure regions that draw in moist air from the oceans, thereby generating prevailing winds capable of carrying moisture and sustaining rainfall far within continents.

Reforestation may re-activate such pumps, returning rainfall to continental interiors.



Forests regulate water supplies

Regulation of water flows



4 Forests regulate water supplies in many ways. High altitude forests can intercept fog and cloud droplets, which may account for up to 75% of total catchment runoff. Where such forests have been removed, the atmospheric moisture present in clouds may move on to other locations. This could represent an important loss to local, downstream water supply. Forest clearing may have several, sometimes opposing, effects on water supply, however. Less trees means less water is being evaporated and more groundwater feeds as stream flow into water supplies downstream. Loss of tree cover promotes soil degradation that leads to reduced soil infiltration and water retention capacity, and in turn reduces groundwater reserves that maintain dry season base flows.

Forests reduce flood risk and erosion

Regulation of water flows



5 In Europe, the forested areas are the main source of groundwater, and they absorb precipitation and reduce the risk of excess surface flow and floods and erosion. In this respect, the groundwater resources in northern and western Europe are in no danger as is the case in central and southern Europe. The reduction of forest cover may increase surface flow and floods. In northern Europe, the increasing precipitation may also increase the risk of floods even though the forest cover buffers watersheds.

